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ABSTRACT

The Rand paper on programs facilitating the mid-life career redirection of unemployed aerospace professionals is 1 of 20 policy-related research reports commissioned by the Division of Social Systems and Human Resources in the Research Applied to National Needs Program of the National Science Foundation. It is based on the evaluation of some 300 items of literature on the topic of mid-life career redirection. Evaluation criteria were internal and external validity and policy relevance. The paper evaluates those items which assess the effectiveness of the private and public sectors of our economy to mount schemes to deal with the problem of the involuntary career change of aerospace engineers and scientists. It assesses employment programs ranging from those based on the assumption that comparable jobs are available somewhere in the economy to others which assume that retraining and skills conversion are required in order to get professionals reemployed. The review of the literature revealed that unsuccessful retraining programs failed because of inadequate program design, retraining costs, trainees' age, and the nature of labor market information systems. It was concluded that, if retraining programs were to be successful, counseling and job information services should be a prominent feature of such programs. (Author/BP)

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PROGRAMS TO AID UNEMPLOYED AEROSPACE PROFESSIONALS: IMPLICATIONS FOR MID-LIFE CAREER REDIRECTION

Velma M. Thompson

June 1975

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Abstract

of

PROGRAMS TO AID UNEMPLOYED AEROSPACE PROFESSIONALS:
IMPLICATIONS FOR MID-LIFE CAREER REDIRECTION

by

Velma Montoya Thompson

An appraisal of programs to aid unemployed aerospace engineers and scientists constitutes an interesting test of the ability of the private and public sectors of our economy to mount schemes to deal with the problems of involuntary career changers, many of whom fall into the mid-life classification. This article evaluates those items which assess the effectiveness of these programs for their conclusions as to the nature of the relatively successful ones and for the policy implications of these conclusions for programs for mid-life career redirection. This literature is found to, at best, describe the few retraining programs that were successful in enabling former aerospace professionals become reemployed, those which mainly performed information-producing employment services to reduce applicant and employer hiring costs, and laments the fact that, in general, private and public employment agencies did not provide the efficient information services. This article provides explanations for the underprovision of these services. Private employment agencies had little incentive to produce them as they were unable to capture the private returns to these services, and public employment agencies traditionally had served a clientele with qualitatively different job search requirements. With respect to the most beneficial nature of retraining programs for individuals attempting mid-life career transfers, it appears from the above that counseling and job information services should be a prominent feature of such programs.

PREFACE: THE CONTEXT OF ANALYSIS

The following article on programs to facilitate the mid-life career redirection of unemployed aerospace professionals is from An Evaluation of Policy Related Research on Programs for Mid-Life Career Redirection,* one of twenty reports commissioned by the Division of Social Systems and Human Resources in the Research Applied to National Needs (RANN) Program of the National Science Foundation for the purpose of evaluating policy-related research in various categories in the field of human resources.

Our report was based on the evaluation of some 300 items of literature bearing on the topic of mid-life redirection of careers. Briefly, our criteria for evaluating the literature were internal validity, i.e., whether the research used appropriate scientific methods to deal with the questions asked, external validity, i.e., whether the authors' conclusions were in agreement and seemed consonant with general research in the field, and policy relevance, i.e., whether the findings could be generalized to other programs for mid-life career redirection. Our principal working instrument for assessing the literature on training programs was a detailed checklist devised especially for the project; the checklist enabled us to perform a uniform evaluation of the internal validity, external validity, and policy relevance of each item.

The principal lesson of the following article for programs for mid-life career redirection, that counseling and job information services to reduce applicant and employer hiring costs should be a prominent feature of such programs, was substantiated by the assessments of other training programs and was included in the final policy recommendations for mid-life career redirection programs.

The final report describes the scale and intensity of interest in mid-life redirection programs, the nature of the potential clientele for such programs, guidelines for designing, operating, and financing possible new programs, and additional research requirements. It was submitted to the Division of Social Systems and Human Resources in February 1975. At that time the final report also was distributed to members of the academic and policymaking communities.

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*Anthony H. Pascal, et al., The Rand Corporation, R-1582/2-NSF, February 1975.

PROGRAMS TO AID UNEMPLOYED AEROSPACE PROFESSIONALS: IMPLICATIONS FOR MID-LIFE CAREER REDIRECTION

Velma Montoya Thompson

In the late 60s and early 70s, shifts in government procurement policy resulted in substantial reductions in output in the aerospace industry. This in turn caused layoffs of skilled blue collar and white collar aerospace workers. The unemployment among engineers went from 0.3 percent in 1967 to 3.0 percent in 1971.[1] About 60,000 engineers were then out of work.[2] One response was the establishment of programs to help former aerospace professionals enter new lines of work. The U.S. Department of Labor claims that 25,000 persons had been moved into new jobs through these programs by the end of 1972. An appraisal of the success of these programs constitutes an interesting test of the ability of the private and public sectors of our economy to mount schemes to deal with the problems of involuntary career changers, many of whom fall into the mid-life classification. Hence, the literature which assesses these programs was chosen for analysis as part of our large-scale review of the literature bearing on the topic of mid-life career redirection.[3]

Programs to aid unemployed aerospace engineers and scientists ranged from those based on the assumption that comparable jobs were available somewhere in the economy to others which assumed that retraining and skills conversion were required in order to get these professionals reemployed. Thus, the programs varied from clinics to teach engineering professionals the art of job finding to programs providing the technicalities of alternative vocations augmented by instruction in job-search skills adapted to the specific attributes and requirements of former aerospace professionals.

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[1] Thomas L. Allen, "Aerospace Cutbacks: Impact on the Companies and Engineering Employment in Southern California," unpublished Ph.D. dissertation (Massachusetts Institute of Technology: August 1972), p. 11.

[2] J. M. Kinn, "Unemployment and Mid-Career Change: A Blueprint for Today and Tomorrow," *Industrial Gerontology*, No. 18 (September 1973): 47.

[3] See Anthony H. Pascal, et al., *An Evaluation of Policy Related Research on Programs for Mid-Life Career Redirection* (The Rand Corporation: February 1975, R-1582/2-NSF), funded by the Division of Social Systems and Human Resources in the Research Applied to National Needs (RANN) Programs of the National Science Foundation. This article is abstracted from this Report. The views expressed herein are those of the author and should not be attributed to NSF.

Some programs were announced specifically as a test of the possibilities of mid-career transfer for a group of people vulnerable to shifts in national policy.[4] Programs have been sponsored by the federal government, state and local governments, professional societies, trade associations, merchants and manufacturers associations, individual companies, universities, and alumni associations.

Many articles were written upon the launching of various programs for aiding unemployed aerospace engineers and scientists that praised these programs, but few have assessed their effectiveness.[5] Those five items which attempt to assess these programs are evaluated here for their consistency with standard, scientific methods of evaluating training programs, their conclusions as to the nature of the relatively successful and unsuccessful programs, and for the implications of these conclusions for programs for mid-life career redirection.

Those items which attempt to assess these programs constitute loose assessments of a limited number of different programs and suffer from a tendency to assess the efficiency of retraining programs in terms of the rate of placement of trainees, immediately or within a very short time after the completion of training. A preferable measure for our purposes would be a comparison of the relative gains in wages of those unemployed aerospace workers completing retraining over a period of months or years with the wage experience of control groups of unemployed aerospace workers who did not participate in training programs, measured for trainees of varying age and other characteristics, completing different types of retraining programs. Also, an itemization of the costs associated with the various training programs would enable us to compare their merits.

The literature uniformly sidesteps the question of which types of programs would be expected, a priori, to be successful in enabling former aerospace professionals to become reemployed. One would expect that those

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[4] Jerome Ziegler, "Retraining Engineers into Urban Specialists," *Change in Higher Education* III (Winter 1971-1972): 19.

[5] The items which focus upon an assessment of these programs are the following: Allen, "Aerospace Cutbacks"; Marvin Olsen, *Retro Phase I, Training and Placement Report* (Department of Health, Education and Welfare: November 1, 1972) and *Retro Phase II, Training Implementation and Placement Report* (Department of Health, Education and Welfare: September 30, 1973); Albert Shapero, "Making the Technical Unemployed Productive Again," *Innovation XXXI* (May 1972): 38-49; Joan Sweeney, "Retraining in Aerospace--A New Problem," (Los Angeles Times: June 30, 1973): 1.

programs which attempted merely to provide school-like courses in the technicalities of proposed alternative vocations would prove less successful than those programs which augmented the teaching of vocational technicalities with instruction in job-search skills adapted to the specific attributes and requirements of former aerospace professionals. While previously existing, heavily subsidized, schools already provided the technical courses at some comparative advantage, not enough institutions were available to teach the particular job-search skills.

As we shall see, the studies agree that the technical training programs, in fact, were failures, while programs that mainly performed information-producing employment services to reduce applicant and employer hiring costs proved highly effective in enabling former aerospace professionals become reemployed. They also agree that, in fact, both private and public employment agencies proved somewhat effective only in placing blue collar aerospace workers. Part of the reason for this was that a former aerospace professional, having been informed by a private employment agency about his realistic alternative job opportunities and how to sell himself to alternative employers, could then take a job with an employer the agency did not send him to, and thus save himself that portion of his salary due the private agency as a fee. Thus, private employment agencies, which habitually collect only when they find a specific job for a client, were left with little or no incentive to produce the effective information services for former aerospace professionals because, although the social return from placing former aerospace professionals was great, private employment agencies were unable to capture the private returns to the effective information-producing activities. There was greater profit in finding jobs for people who were already aware of the range of job opportunities and knew how to conduct themselves in interviews. Such people go to a private employment agency only when they are looking for specific job openings. Similarly, public employment agencies generally did not provide the effective information services; such agencies traditionally serve a less-educated clientele with qualitatively different job-search requirements from those of unemployed aerospace professionals.

The few items in the literature that assess these programs agree on one point: with few exceptions, the programs proved mediocre in aiding these workers to become reemployed. With few exceptions, those programs aimed at retraining aerospace professionals for other fields of engineering-related work have been labeled failures--except, in some cases, by the governmental or school officials who administered them.

THE UNSUCCESSFUL PROGRAMS: REASONS FOR PROGRAM FAILURES

The unsuccessful retraining programs are said to have failed mainly because of inadequate program design, especially their failure to deal with the special attributes and requirements of former aerospace professionals, several of which generally hindered their ability to find employment outside aerospace markets. Some programs offered little opportunity to learn new job skills. For example, one program gave a four-week orientation course on city governments to former aerospace workers, on the explicit assumption that their expertise could be transferred directly to the field of urban planning without *any* retraining of these workers.[6] Yet there is recent evidence that some retraining is required to turn an aerospace engineer into, say, an environmental engineer, especially if he is to compete with younger, recently graduated environmental engineers.[7] Other training programs successfully imparted a new skill to their participants or at least made them much more familiar with the nature of the proposed new work situation; however, "overall findings indicate that these programs and the number of others purporting to guarantee employment in a new skill field were, for the most part, not directed toward any real job vacancies where an engineer could put his new skills to work."[8]

Potential employers were found to have considerable resistance to hiring former aerospace professionals for non-aerospace work, especially if the employers were to bear some of the costs of retraining. Some

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[6]Ziegler, "Retraining Engineers into Urban Specialists," p. 19.

[7]Sweeney, "Retraining in Aerospace," p. 1.

[8]Allen, "Aerospace Cutbacks," pp. 250-251. Quoted by Sweeney, "Retraining in Aerospace," p. 10.

reasons cited for their reluctance were that the former aerospace professionals sought salaries generally about 25 to 40 percent higher than prospective employers were willing to pay for the openings available, leading prospective employers to suspect that the specialists would return to aerospace once conditions in that industry improved; and that employers regarded aerospace professionals as both "overspecialized" and insufficiently cost-conscious. Thomas Allen analyzed 1601 replies to a questionnaire he mailed to laid-off aerospace engineers in Los Angeles and Orange Counties and found the so-called "aerospace stigma" to be consistent with the engineers' replies. "Only those [engineers] who went into business for themselves showed any strong commitment to remaining in their new employment and not attempting to move back to engineering or professional work when the market improved."[9] Allen also found that many engineers in his sample were "overspecialized" in that they lacked general engineering skills that they could transfer to other phases of engineering. Allen rationalized the professionals' alleged lack of concern about costs as reflecting the high critical tolerance limits associated with aerospace projects, in contrast to those of civilian engineering projects.

Age, however, was a factor that inhibited the opportunities for career transfer of some of these professionals. Older aerospace scientists and engineers--and "older" was variously defined as over 49, over 55, and, in one case, over 45-- had the greatest difficulty in finding employment outside the aerospace industry and were "knocked out of the aerospace defense markets altogether."[10] That such older unemployed engineers tended to be less flexible than their younger counterparts with respect to salary requirements was explained by the Special Assistant to the Chief of the Employment Services Division of the Washington, D.C. Manpower Administration: "The older man probably has to put two kids through

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[9] Allen, "Aerospace Cutbacks," p. 239.

[10] Shapero, "Making the Technical Unemployed Productive Again," p. 45; Paul H. Thompson, "The Effects of Unemployment on Engineering Careers," (U.S. Department of Labor: November 1972), p. 92.

college, make the final payments on a mortgage, and maybe help support his parents."[11] Allen's survey led him to conclude that "employers associate age [over 45] with inflexibility, technical obsolescence, health problems and high pay aspirations."[12] The problem for older workers was still further accentuated by an upsurge in the supply of young professional and technical workers, caused by the graduation from college of the first products of the post-war baby boom.[13] According to the department head of a university engineering school, older aerospace workers were likely to be relatively technologically obsolescent: "Our freshmen start right in on a computer; they deal with advanced concepts and are taught to think conceptually; the man who graduated 25 or 30 years ago doesn't know computers and if he hasn't been going back to school regularly, he no longer even knows the field in which he was trained."[14] Yet, "none of the programs to aid the unemployed appear explicitly to recognize the age problem."[15]

While the variables discussed above are mentioned in all the items attempting to assess the general failure of the retraining programs in question, Allen attributes the failure partly to the nature of labor market information systems and their effects upon former aerospace professionals. The goal of those is to transmit information about the characteristics and availability of job vacancies to potential workers, and about workers' characteristics to potential employers. Allen conjectures that there is a "barrier" to the employment of former aerospace workers outside of the aerospace industry resulting from a possible "increasing dependence of workers and employers on informal labor market information systems which in turn discriminate

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[11] Quoted by Allen, "Aerospace Cutbacks," p. 275.

[12] Allen, "Aerospace Cutbacks," p. 275.

[13] H. Runyon, "Professionals Join the Jobless," *Federal Reserve Bank of San Francisco Monthly Review* (December 1970): 238.

[14] Alan Cranston, "Aerospaced Out," *Playboy* (March 1972): 162.

[15] Shapero, "Making the Technical Unemployed Productive Again," p. 45.

against those workers outside any specific industrial or occupational labor market."[16] Hence, Allen considers the extent to which the engineers in his sample who succeeded in becoming reemployed utilized informal versus formal sources of job-finding.

This issue of the relative importance of informal and formal sources of job information may be significant, in general, to any person attempting a career transfer into a different industry, since such an individual is likely to have fewer professional contacts in that industry than an individual already working in that industry. Informal sources of jobs are those that do not involve the use of any outside organization or agency to arrange a contact between the employer and the job applicant. They can include referrals by present employees, referrals by other employers, friends, or acquaintances, and "gate applications" made in response to a sign posted on the employer's premises or made by simply walking in without any referral. Formal sources include state employment services, private employment agencies, newspaper advertisements, colleges, and professional societies. The rationale for Allen's conjecture is that the use of informal sources can entail lower applicant and employer hiring costs than those of formal sources.[17] For example, with respect to employee referrals, friends can give an applicant inside information on the nature of prospective jobs, and are unlikely to recommend potentially poor workers since their own reputation at work may be affected by the quality of their referrals. And employers who are satisfied with the quality of their present workforce are likely to get applicants of similar quality.

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[16] Allen, "Aerospace Cutbacks," p. 2. This interpretation of Allen's hypothesis is inferred from his statistical tests. Sometimes Allen discusses the hypothesis as a possible growing dependence on employee referral in hiring decisions across the whole economy (p. 2); sometimes he treats it as descriptive mainly of a possible growing dependence on employee referral in hiring decisions in the aerospace industry (p. 56); sometimes he treats it radically differently as the possible "segmentation" and "Balkanization" of labor markets (pp. 31-33); and sometimes he interchanges hypotheses in the same sentence.

[17] Allen Rees, "Information Networks in Labor Markets," *American Economic Association Papers and Proceedings* LVI (May 1966): 559-566.

The responses to Allen's questionnaire corroborate the greater preference of engineers for informal sources of information as well as the superior effectiveness of these methods; for all the engineers in his sample, over fifty percent of all new jobs were generated through informal channels. However, those engineers in Allen's sample who found employment in occupations other than engineering used informal sources about as much as did all those engineers who found jobs, including jobs in engineering.[18]

THE SUCCESSFUL PROGRAMS

Nevertheless, there were a few retraining programs identified by at least one author as effective in terms of rates of placement. Along with providing technical retraining, those programs reduced retrained applicants' information costs by rigorously informing them of the nature of their prospective jobs outside aerospace, or reduced the costs to employers of learning about retrained applicants.[19] One program required that trainees be willing to relocate as a necessary screening criterion, and included the counseling of trainees "on career opportunities, wages, type of work conditions, etc., so that he is fully aware of all aspects of the job for which he is being trained."[20] Another effective program required unemployed scientists and engineers to go out and find jobs for others like themselves; this procedure took on the form of a personal validation system that professional headhunters seldom achieve and broadened the perception of the unemployed jobhunter as to what jobs were available and what jobs technical people could perform. The writer who identified this program as effective noted that "there is something very educational in the frustrating experience of trying to get another unemployed engineer to realize the opportunity you've gotten for him when he stubbornly insists it doesn't fit his capabilities."[21] Another

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[18] Allen, "Aerospace Cutbacks," pp. 208, 210, 215.

[19] Allen, "Aerospace Cutbacks," pp. 267, 277. Allen also identifies as effective those programs that created new jobs outright for unemployed aerospace engineers. We ignore such programs since they likely fall outside the realm of possibility with respect to current policy recommendations for individuals seeking mid-life career redirection. In general, Allen suggests governmental subsidization of programs to enable these workers to become reemployed, without providing any justification for such subsidization.

[20] Marvin Olsen, *Retro Phase I, Training Implementation and Placement Report*, Department of Health, Education and Welfare, November 1, 1972, p. 19.

[21] Shapero, "Making the Technical Unemployed Productive Again," p. 46.

effective retraining program attempted to identify potential placements prior to the beginning of the program and followed this up by an intensive effort to place graduates of the program in these jobs upon their completion of the orientation phase of the course.[22]

The literature agrees that, in general, these information services were ineffectively provided by federal and state employment services. Yet, after the magnitude and duration of unemployment of former aerospace professionals became apparent, public employment services consolidated their aid to those professionals in certain offices. The consolidation sometimes led to the creation of workshops that produced the efficient information services and proved successful in placing former aerospace professionals in alternative jobs. Underwritten by government funding, some societies of professional aerospace workers provided similar efficient information-producing services with similarly effective placement results.[23]

The next section restates the rationale for these results and relates them to the general question of what program features would be effective in retraining programs for individuals attempting mid-life career transfers.

AN EXPLANATION OF THE FINDINGS AND THEIR IMPLICATION FOR PROGRAMS FOR MID-LIFE CAREER REDIRECTION

The successful programs to help former aerospace professionals become reemployed did more than provide school-like technical courses in proposed alternative vocations. They reduced retrained applicants' information costs by rigorously informing them of the nature of their prospective jobs outside aerospace, or reduced the costs to employers of learning about retrained applicants. The less successful programs that did confine themselves to technical course offerings ignored the special attributes and requirements of former aerospace professionals, several of which generally hindered their ability to find employment outside aerospace markets. One writer said that the effective programs at least served to "lower engineers' [employment] expectations in an overall sense."[24] Also, the narrowly technical

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[22] Allen, "Aerospace Cutbacks," p. 251.

[23] Allen, "Aerospace Cutbacks," pp. 252-253.

[24] Allen, "Aerospace Cutbacks," p. 253.

programs were often only tangentially administered by educational institutions; historically-proven educational institutions likely would have done a more efficient job of conveying the techniques of different vocations.

Public and private employment agencies generally did not produce those information services which proved effective in enabling unemployed aerospace professionals become reemployed. Former aerospace professionals benefited from information about their realistic alternative jobs and how to sell their "reformed" selves to employers. Public employment agencies generally did not provide these information services. Such agencies traditionally have served a less-educated clientele with different job-search requirements, and former aerospace professionals were generally sufficiently scattered geographically that the unemployment problems of the few aerospace professionals appearing at each government employment office received minimum attention.

Private employment agencies placed a low priority on the production of the efficient information services for former aerospace professionals, as they were unable to appropriate the private returns to these services. Once a buyer of these information services possesses the information about his best alternative occupations and how to behave in an interview, he can secure a job independently of the seller. And if a private employment agency were to attempt to sell its information directly as a private counseling service, it would have little incentive to produce the efficient information, because its receipts would then not be tied to the quality of its information. Knowing that, its customers would not be willing to pay much for its information.

With respect ot the general question of what program features would be effective in programs for individuals attempting mid-life career transfers, it appears from the above that the provision of counseling and job information services should be an important feature of such programs. Let us assume, for example, that market conditions are such that for at least the next ten years, research physicists cannot expect to earn salaries in their field comparable to those of five years ago. Bitter as the truth may be, the physicists should be thoroughly informed about it and accept

it so they convince prospective employers in alternative occupations that they intend to remain in any new occupations they enter. A more obvious example of career-changers who will require intensive information services are women whose children have grown and who have been out of the labor force for fifteen or twenty years or have never worked outside their homes. Usually, such a woman has a broad range of information requirements. She wants to know at least the following: In what occupations does she have a comparative advantage? What are the current and future employment opportunities for women in those occupations? What are the comparative costs of and returns to her entering those occupations? A variety of programs to aid the mid-career transfer of middle-aged women have been introduced in the last couple of years. While no study has yet identified which of those programs are proving successful in aiding the career transfer of middle-aged women, we expect that the successful ones will be found to provide abundant counseling and job information services over and above technical training.

BIBLIOGRAPHY ON PROGRAMS TO AID UNEMPLOYED ENGINEERS AND SCIENTISTS

Advisory Committee on Science and Engineering, California Assembly Science and Technology Advisory Council, Edward W. Edmunds, Chairman, "Technical Unemployment Today and the Future of Technology in California," Report to the Assembly on May 14, 1971.

Allen, Thomas L., "Aerospace Cutbacks: Impact on the Companies and Engineering Employment in Southern California," unpublished Ph.D. dissertation, Massachusetts Institute of Technology, August 1972.

Brookner, Eli, and Jerry Grey, "The Aerospace Professional--His Present, His Future, and His Impact on the Nation," AIAA Paper #71-1023 given in New York, October 1971.

Brouns, R. J., *An Experimental Re-employment Program for Determining Significant Factors in Career Transfer Among Unemployed Engineers and Scientists in King County, Washington*, Human Affairs Research Center, Battelle-Northwest, Seattle, Washington, 1971.

Cartter, Allan M., "Scientific Manpower for 1970-1985," *Science*, Vol. 72, April 9, 1971, pp. 132-140.

Cranston, Alan, "Aerospaced Out," *Playboy*, March 1972, pp. 44, 106, 162, 164-165, 168.

Dobb, Allen R., *The Job Hunter: The Diary of a Lost Year*, Pocket Books, New York, 1968.

Donin, Robert, "Unemployed Executives: Overqualified for Market," *The Washington Post*, July 24, 1972, Section 2, Part 1.

Draper, A. M., *Alternate Jobs for Aerospace Workers: Examples of Employment Opportunities in Private Industry*, California Occupational Analysis Field Center, Los Angeles, 1972.

Fishman, Leslie, et al., *Re-employment Experiences of Defense Workers*, U.S. Arms Control and Disarmament Agency, Washington, U.S. Government Printing Office, 1968.

Folk, Hugh, *The Shortage of Scientists and Engineers*, D. C. Heath and Company, Lexington, Massachusetts, 1970.

Freeman, Richard B., "The Science Manpower Market in the 1970's," unpublished Working Paper, University of Chicago, 1971.

"IEEE and the Unemployment Problem," *IEEE Bulletin*, May 1971, pp. 2-5.

Inter-Industry Commission on Reemployment of California Engineers and Scientists, *Phase One Report*, Report to Lieutenant Governor Edward Reinecke, Inter-Industry Commission, California, May 12, 1971.

J. M. Kinn, "Unemployment and Mid-Career Change: A Blueprint for Today and Tomorrow," *Industrial Gerontology*, No. 18, September 1973, pp. 47-59.

McLean, Deckle, "When Professionals Lose Their Jobs," *Boston Sunday Globe*, April 16, 1972, pp. 18-32.

Mooney, Joseph D., "An Analysis of Unemployment Among Professional Engineers and Scientists," *Industrial and Labor Relations Review*, Vol. 19, July 1966 pp. 517-528.

"More Engineer Retraining Studied," *Aviation Week and Space Technology*, Vol. 95, September 6, 1971, pp. 14-15.

Myers, Charles A., "Book Review of Folk's, 'The Shortage of Scientists and Engineers,'" *Journal of Economic Literature*, Vol. 9, December 1971, pp. 1217-1219.

National Science Foundation, "Unemployment Rates for Scientists, Spring, 1971," *Science Resource Studies Highlights*, NSF 71-26, July 1971.

"New Skills for Out of Work Engineers," *Environmental Science and Technology*, Vol. 6, April 1972, pp. 316-317.

Olsen, Marvin, *Retro Phase I, Training Implementation and Placement Report*, Department of Health, Education and Welfare, November 1, 1972.

-----, *Retro Phase II, Training Implementation and Placement Report*, Department of Health, Education and Welfare, September 30, 1973.

Potter, Geoffrey A., *AIAA Employment Workshops, Final Report*, Vol. 1, U.S. Department of Commerce, January 1972.

"Recycled Aerospace Men Enter Construction," *Engineering News Record*, Vol. 189, September 7, 1972, p. 46.

Rees, Albert, "Information Networks in Labor Markets," *American Economic Association Papers and Proceedings*, Vol. 56, May 1966, pp. 559-566.

"The Return of the Engineer," *Money*, November 1973, p. 104.

"Rocky Road Back to the Drawing Board," *Manpower*, Vol. 3, March 1971, pp. 2-7.

Runyon, H., "Professionals Join the Jobless," *Federal Reserve Bank of San Francisco Monthly Review*, December 1970, pp. 236-238.

Shapero, Albert, "Making the Technical Unemployed Productive Again," *Innovation*, Vol. 31, May 1972, pp. 38-49.

"State Panel Told of Gloomy Future for Aerospace Jobless," *Los Angeles Times*, June 30, 1973, p. 1.

Sweeney, Joan, "Retraining in Aerospace--A New Problem," *Los Angeles Times*, June 30, 1973, p. 1

Thompson, Paul H., "The Effects of Unemployment on Engineering Careers," U.S. Department of Labor, Manpower Administration, November 1972.

"Urban Application of Aerospace Skills," *HUD Challenge*, May 1972, pp. 8-10.

Wood, John K., and Anna L. Brown, "A Job Strategy to Develop Personal Potential of Unemployed Professional Workers," *California Personnel and Guidance Association Journal*, Fall, 1971, pp. 13-16.

Ziegler, Jerome, "Retraining Engineers Into Urban Specialists," *Change in Higher Education*, Vol. 3, Winter 1971-1972, pp. 18-20.